CPSC 359 Assignment01

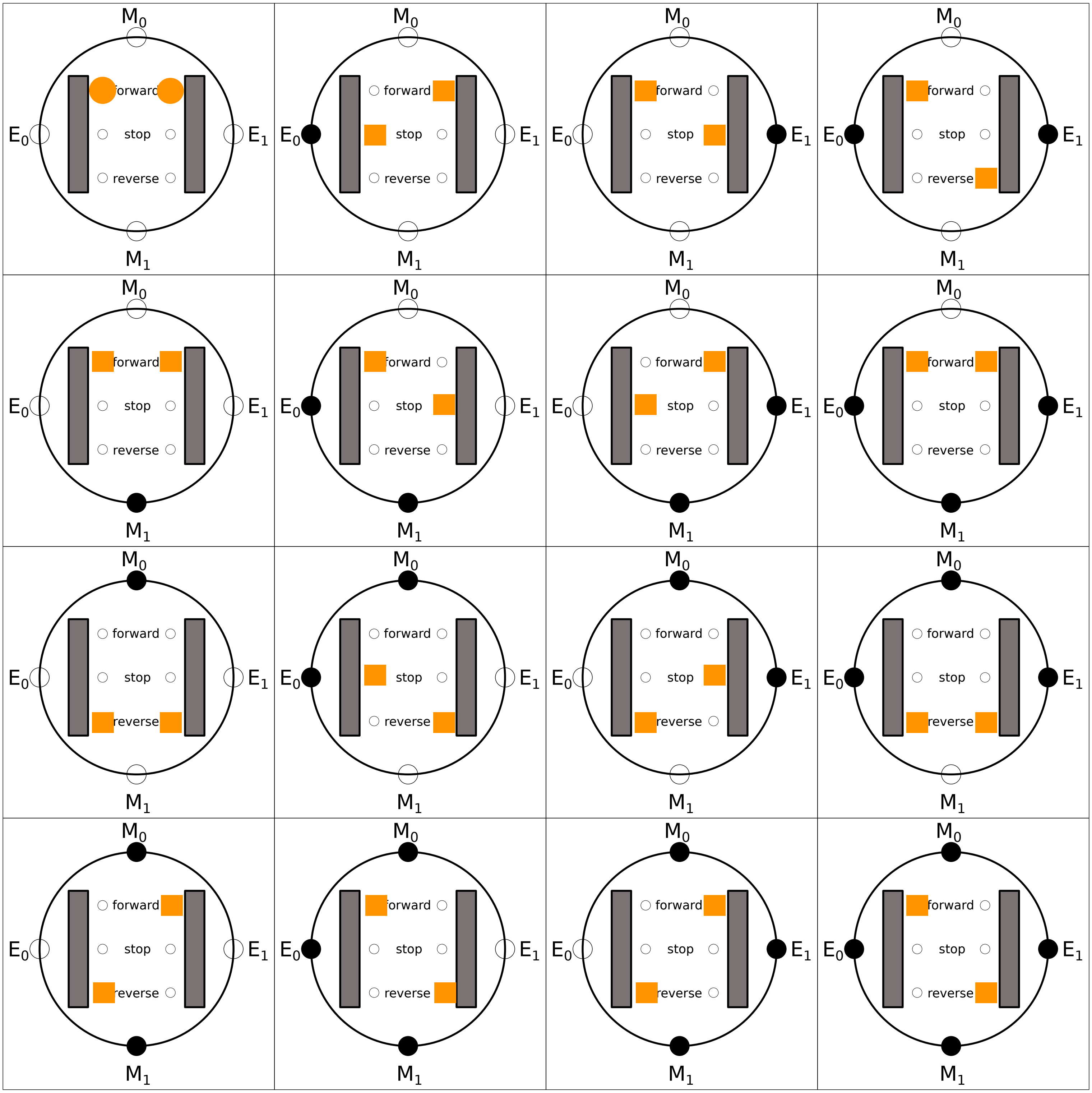
Sijia Yin 30049836

September 22, 2019

1. The inputs for my circuit are M_1, M_0, E_1 and E_0. They represent for sensors. M_1 and M_0 detect the edge of the arena. E_1 and E_0 detect the opponent sumo. If the robot is near the edge, M=1, otherwise M=0. Similarly, if an enemy approaches the robot, E=1; otherwise, E=0.
   My outputs are L_1, L_0, R_1 and R_0. They represent for the wheels. L is the left wheel and R is the right one. L_1 and L_0 means the forward and reverse. If $L_1 = 0$, $L_0 = 0$, then the left wheel stop. If $L_1 = 0$, $L_0 = 1$, then the left wheel goes forward. If $L_1 = 1$, $L_0 = 0$, then the left wheel goes reverse. If $L_1 = 1$, $L_0 = 1$, then it is a not allowed action. Similar to R_1 and R_0.

2. The strategy sheet is provided on the next page. And here are the explanations for my strategy. In addition to the most basic detection of the edge line backward or forward and detection of the enemy forward or backward attack, we also detect the edge line and the enemy at the same time. If I only detect the edge line at one side and the enemy at one side, my strategy is to turn and attack the enemy. This requires the two wheels to work separately for the purpose of turning, that is, one wheel is prohibited, and the other wheel is forward or backward. So, my strategy for detecting an enemy approaching on both sides and one side approaching the edge is to move forward or backward. My strategy for detecting both sides near the edge or enemies on both sides is to rotate on the spot, where the two wheels move in opposite directions. Of course, if the robot cannot detect anything at his four sides, then he will always go forward.

combibot strategy



○ 0/false/low

● 1/true/high

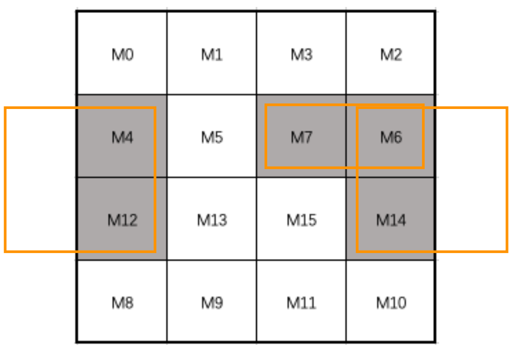
3. These are the design for the combinational circuits.

The truth table is shown as below:

M1	M0	E1	E0	L1	L0	R1	R0
0	0	0	0	0	1	0	1
0	0	0	1	0	0	0	1
0	0	1	0	0	1	0	0
0	0	1	1	0	1	1	0
0	1	0	0	1	0	1	0
0	1	0	1	0	0	1	0
0	1	1	0	1	0	0	0
0	1	1	1	1	0	1	0
1	0	0	0	0	1	0	1
1	0	0	1	0	1	0	0
1	0	1	0	0	0	0	1
1	0	1	1	0	1	0	1
1	1	0	0	1	0	0	1
1	1	0	1	0	1	1	0
1	1	1	0	1	0	0	1
1	1	1	1	0	1	1	0

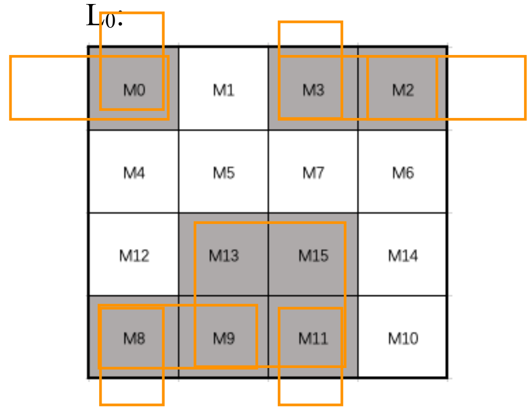
The Karnaugh maps are shown as below:

L_1:



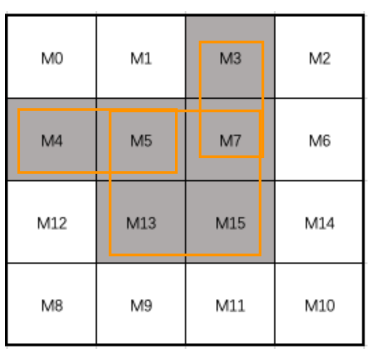
$L_1 = M_0E_0' + M_1'M_0E_1$

L_0:



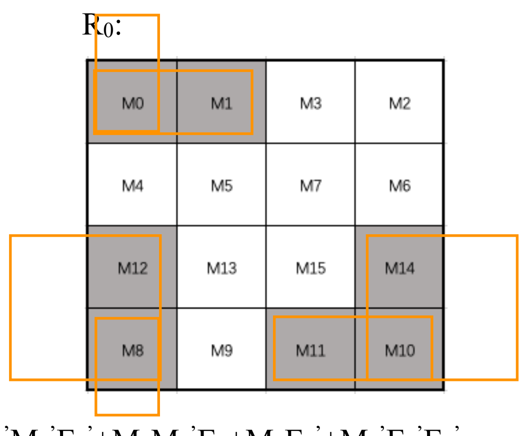
$L_0 = M_1E_0 + M_1M_0' + M_1'M_0'E_1$
$+ M_0'E_1E_0 + M_0'E_1'E_0' + M_1'M_0'$

R_1:



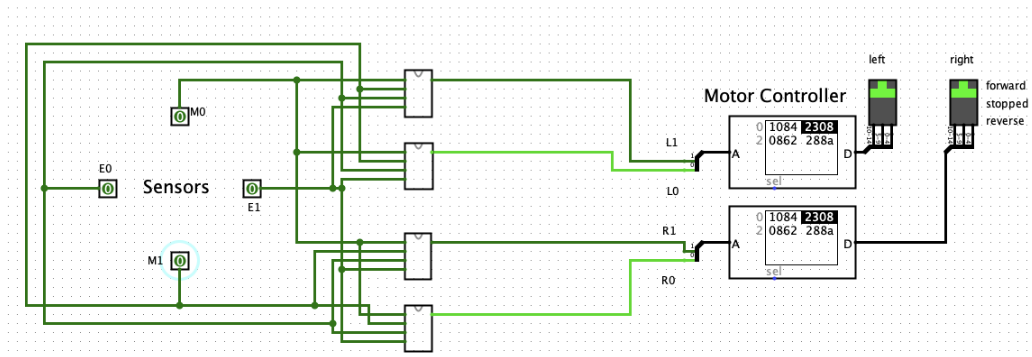
$R_1 = M_1'M_0E_1' + M_1'E_1E_0 + M_0E_0$

R_0:

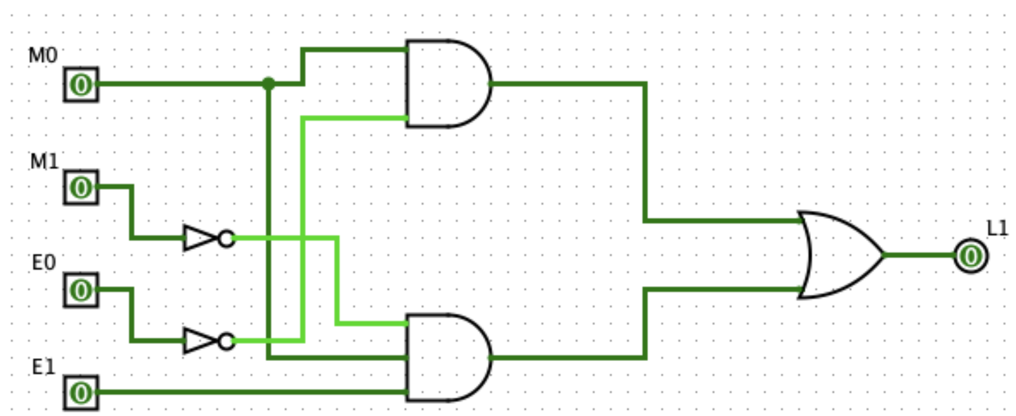


$R_0 = M_1'M_0'E_1' + M_1M_0'E_1 + M_1E_0' + M_0'E_1'E_0'$

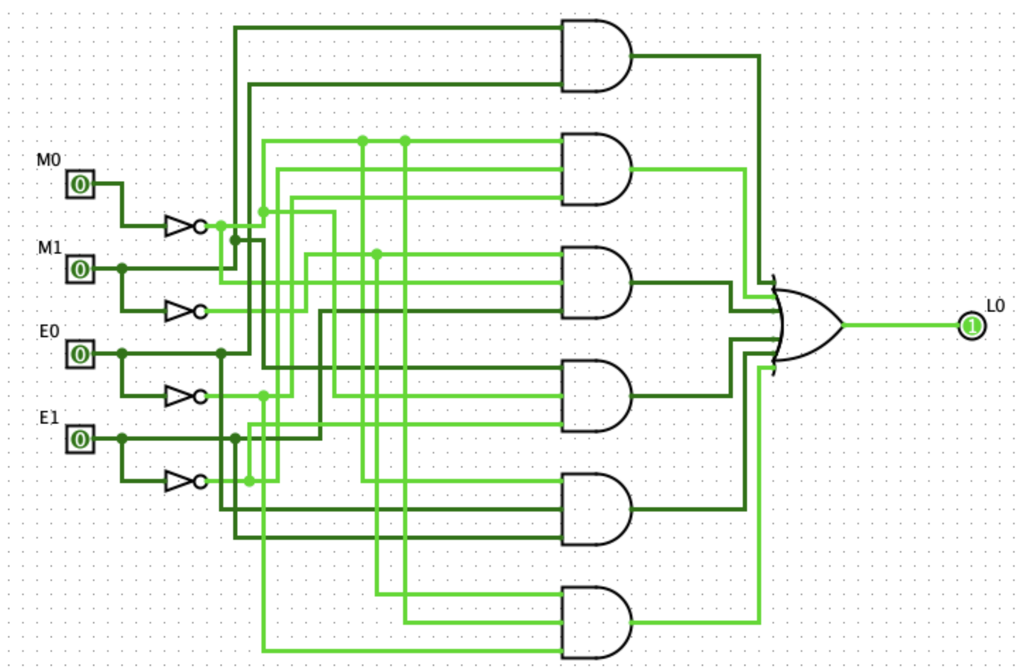
4. These are the design in Logisim. (Also provided in the Logisim)
This is the main circuits:



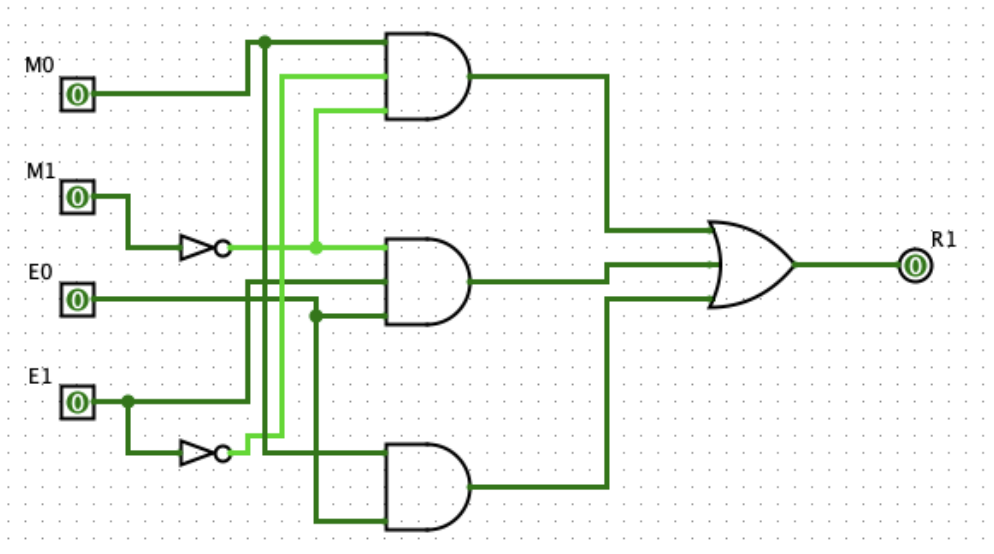
The L_1 subcircuit:



The L_0 subcircuit:



The R_1 subcircuit:



The R_0 subcircuit: